7

INSTRUCTION MANUAL

FT-2FB

YAESU MUSEN CO., LTD.

TOKYO JAPAN

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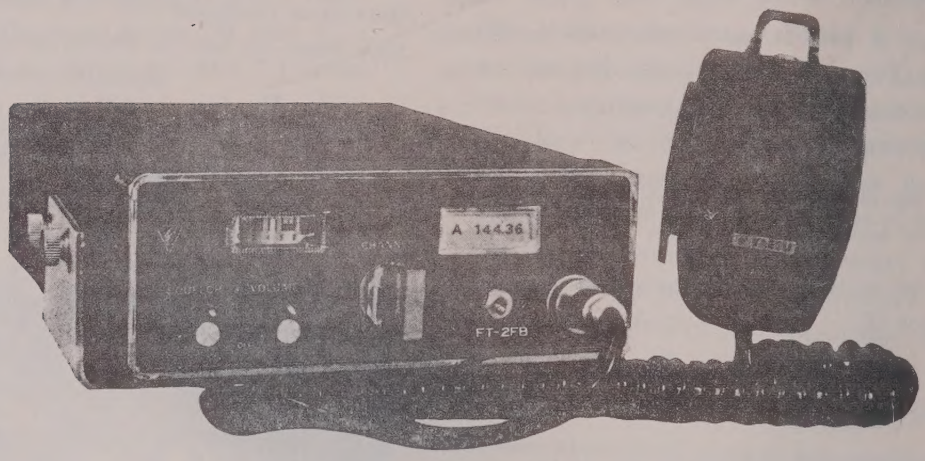
FT-2FB VHF FM TRANSCEIVER



GENERAL DESCRIPTION

The model FT-2FB VHF Transceiver is a precision built, compact, high performance FM transceiver designed to operate in the 2 meter FM amateur radio service. The FT-2FB is completely transistorized and operates from a 12 volt DC system, however, it can be used with a 115-or 230 volt AC power supply together with its AC/DC adaptor. The FT-2FB operates in the 144 to 148 MHz band on 12 crystal controlled channels, with selectable RF power output of 1 or 10 watts. The entire transceiver package is 6-5/8" wide, 2-1/2" high. 10" deep and weighs approximately 4 lbs. Heavy-gauge aluminium construction provides an extremely rugged package light in weight and virtually immune to the effect of vibration and shock.

SPECIFICATIONS

General

Frequency Range	: 144-148 MHz
Number of Channels	: 12 channels, 3 supplied
Power Drain	: Receive 0.31 A Transmit 1.7 A (High) 0.7 A (Low)
Power Source	: 13.5 volts ±15% (negative ground)
Dimensions	: 6-5/8" W x 2-1/2" H x 10" D
Weight	: 4 lbs.
Standard Accessories Supplied	: Dynamic microphone connector plug DC cord fuse Mobile mount

Transmitter

RF Output Power	: 10 watts high, 1 watt low (selectable)
Output Impedance	: 50 ohms unbalanced
Frequency Deviation	: 15 KHz max.
Frequency Stability	: ±0.001% or less
Spurious Radiation	: ±60 db
Tone Burst	: Nominal 1800 Hz (adjustable between 1300 and 3000 Hz)

Receiver

Circuit	: Crystal controlled Double super heterodyne
IF Frequency	: 10.7 MHz & 455 KHz
Sensitivity	: 0.5μV for 20 db quieting
Selectivity	: ±15 KHz –6 db ±25 KHz –50db
Audio Output	: 2.5 watts

For mobile operation, the DC power is supplied by the vehicle battery and charging system.

The transceiver will operate over a voltage range of 10.5 to 14 volts DC. It is necessary to carefully adjust the charging system so that the upper limit of 14 volts is never exceeded.

UNDER NO CIRCUMSTANCES, SHOULD THE TRANSCEIVER BE OPERATED FROM A POWER SOURCE WHICH EXCEEDS 14 VOLTS. DAMAGE TO THE TRANSISTORS MAY OCCUR IF EXCESSIVE VOLTAGE IS APPLIED.

For vehicle installation, it is recommended that the power cord supplied should be used and run directly to the shortage battery for both positive (red cable) and negative (black cable) terminals.

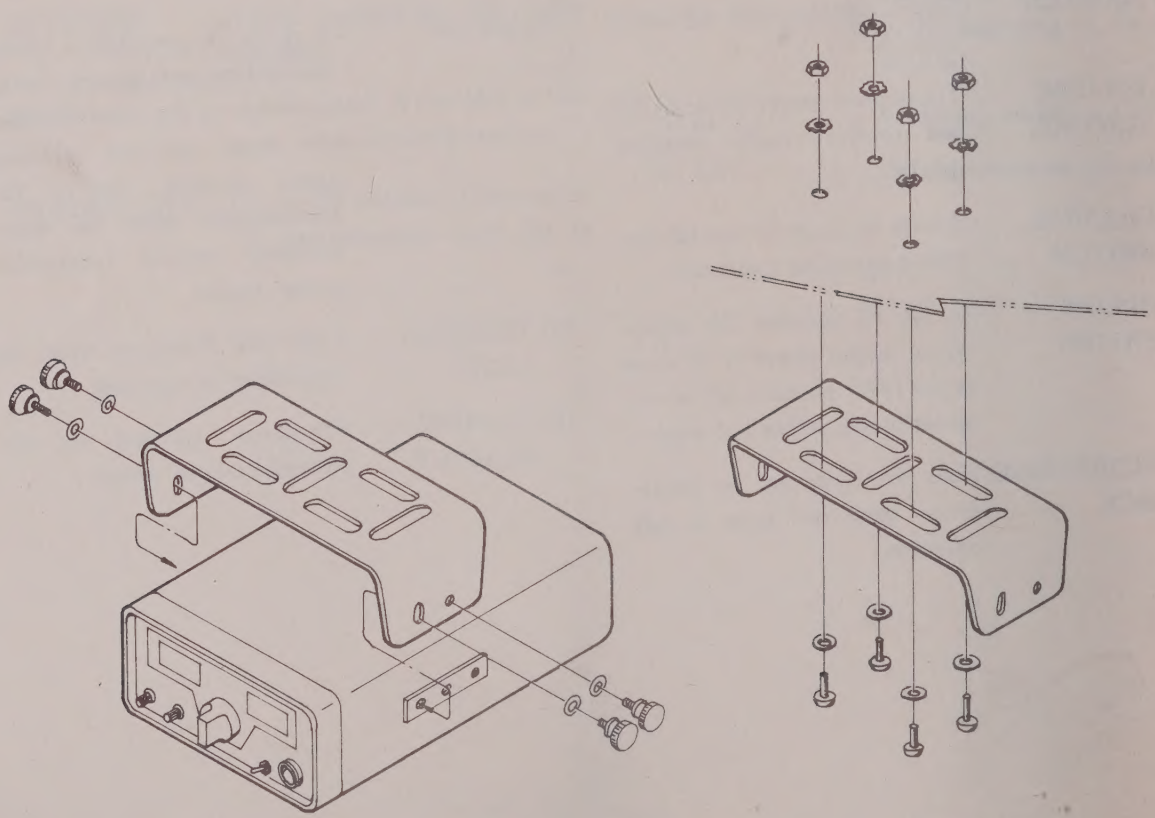
MOUNTING

The FT-2FB is supplied with a mounting bracket and DC power cord including a fuse holder.

The bracket should be fastened to the mounting surface with sheet metal screws. When the transceiver is mounted under the dashboard of a vehicle, keep the air path free from the vehicle's heater duct. Mount the transceiver away from the vehicle's heater system to prevent destruction of components.

Once the unit is in place in the bracket, tighten the knurled screws on the sides to secure the transceiver in the desired position. Connect the microphone, power cable and antenna cable to the transceiver.

In some applications, vertical mounting may be more convenient. The FT-2FB transceiver may be mounted in any position without change in performance.

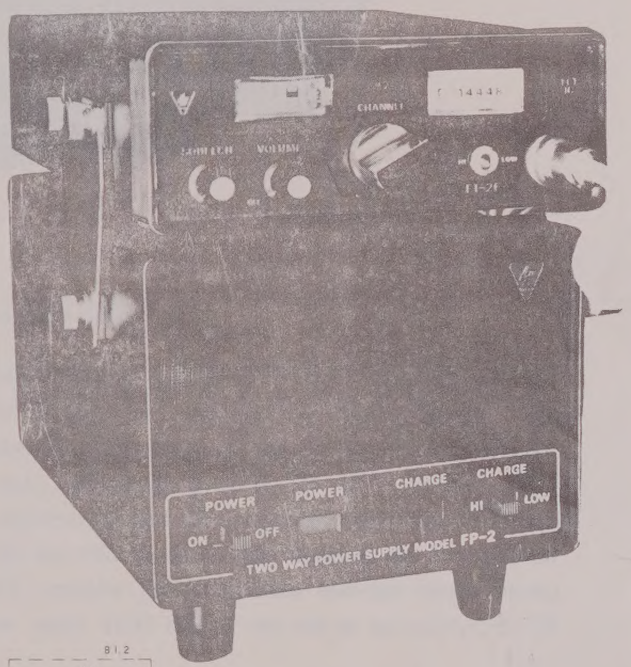


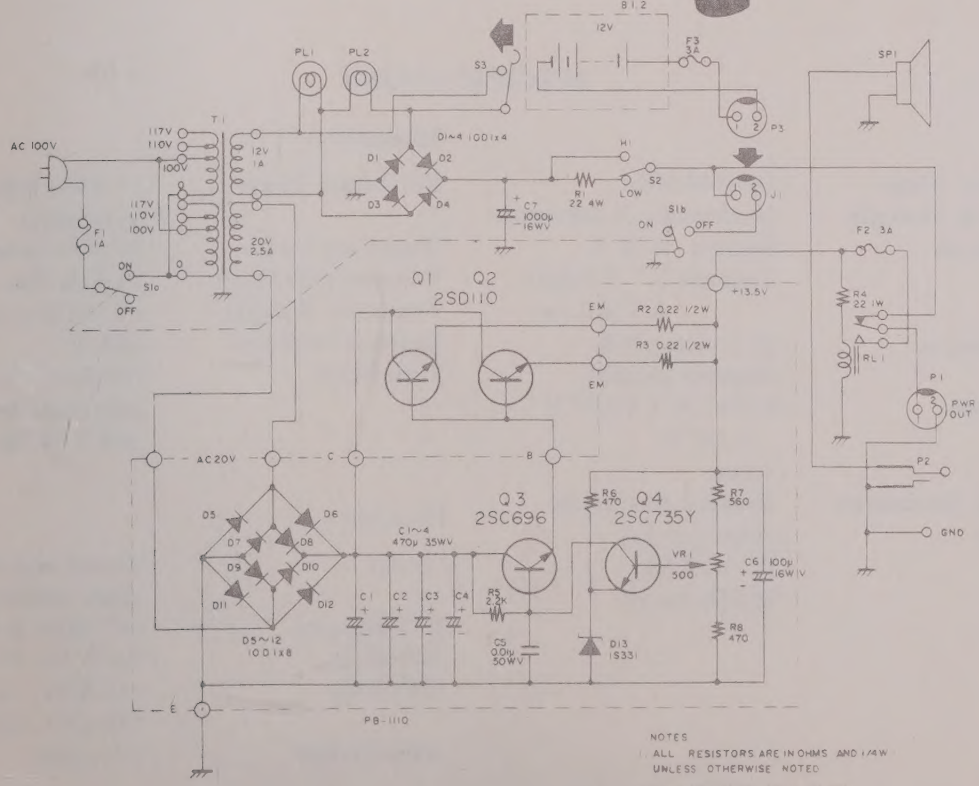
The FT-2FB FM Transceiver is a high quality VHF communication device which, with proper installation, will provide many years of dependable service. To prevent damage to the equipment during installation and use, care should be taken to observe the following precautions:

* Do not attempt to connect the power cord to a power source with the power switch ON.
* Do not connect the microphone with the power switch ON.
* Do not connect the antenna with the power switch ON.
* Do not connect the power cord to the primary power source until polarity and voltage are determined.
* Do not use a mis-matched antenna. Maximum efficiency will be obtained with an antenna system having a VSWR of less than 1.5 : 1.0. The antenna should be tuned to achieve a low VSWR.
* Do not key the transmitter unless an antenna or a dummy load is connected to the antenna coax connector.

POWER REQUIREMENTS

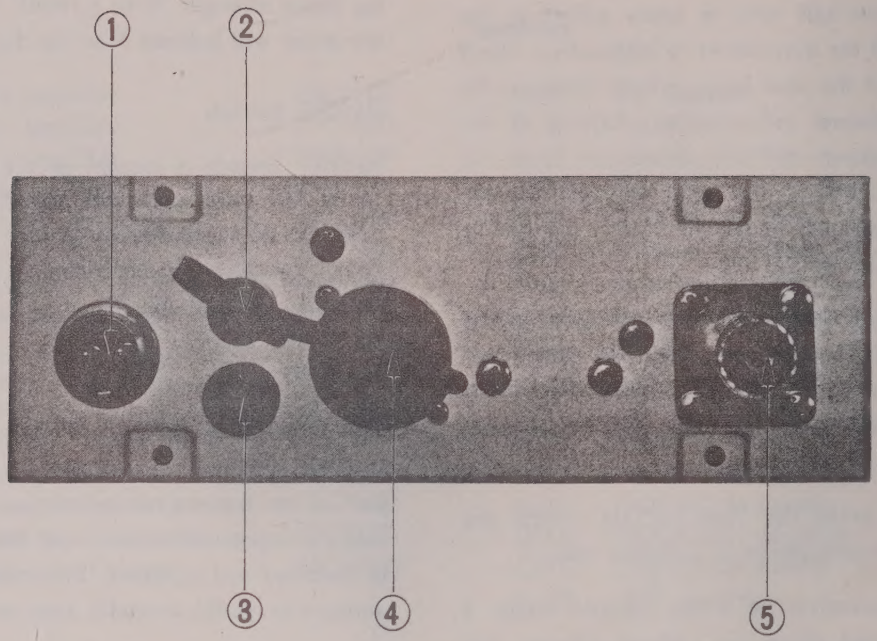
The FT-2FB is designed to operate nominally from a 12 volts DC power source. The transceiver requires 1.7 Amps on transmit and 0.31 Amp on receive. The fuse located in the power cord should be rated at 3 Amps. In fixed stations, the FP-2 AC power supply is used to provide 12 volts DC.





NOTES
1. ALL RESISTORS ARE IN OHMS AND 1/4W UNLESS OTHERWISE NOTED
2. ALL CAPACITORS ARE IN FLADS
3. B1,2, F3 AND P3 ARE OPTION PARTS

FP-2
CIRCUIT DIAGRAM



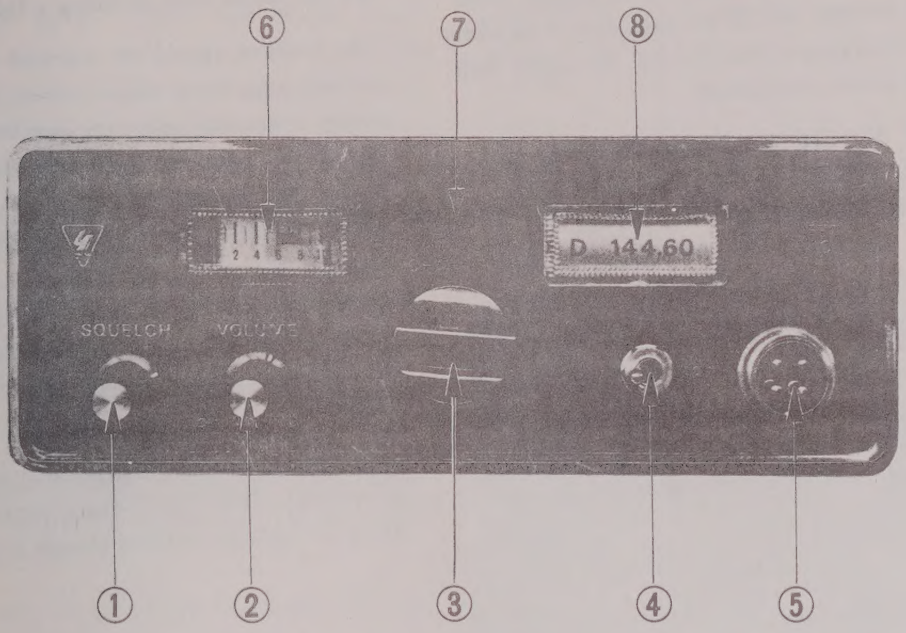
(1) POWER - Power receptacle, DC cable supplied.

(2) SP - Audio output is provided at this jack for an external speaker.

(3) BURST OFF - In the ON position, a tone signal of approximately 2800 Hz is transmitted for a very short time at the beginning of the transmission.

(4) ACC - Accessory socket.

(5) ANT - Coaxial connector for antenna.



(1) SQUELCH - SQUELCH threshold adjustment controls.

(2) VOLUME CONTROL - Transceiver power ON and OFF and receiver audio amplifier gain.

(3) CHANNEL SWITCH - Selects transceiver crystal controlled operating frequency.

(4) HI/LOW SWITCH - In the HI position the transmitter output power is 10 watts. In the LOW position, the transmitter power output is 1 watt.

(5) MICROPHONE JACK - Four pin connector for microphone input and push to talk operation.

(6) METER - A meter is provided to check transceiver performance. During operation in the receive mode, the meter indicates incoming signal strength. And in the transmission mode, the meter indicates relative transmitter power output.

(7) TRANSMIT LIGHT - Light will illuminate when the transmitter is operated.

(8) CHANNEL READOUT - Frequency selected by the channel selector switch.

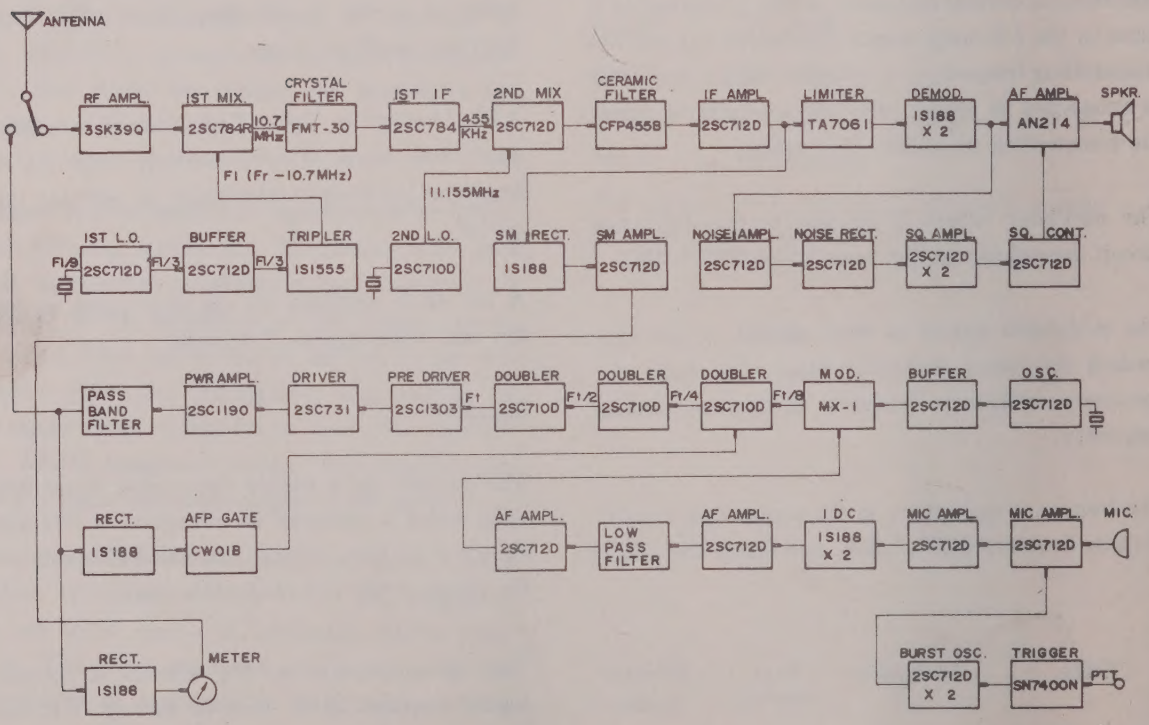
SEMICONDUCTOR COMPLEMENT

Transmitter

Q201	Mic amplifier	2SC712D
Q202	Mic amplifier	2SC712D
Q203	Mic amplifier	2SC712D
Q204	Mic amplifier	2SC712D
Q205	Crystal oscillator	2SC712D
Q206	Buffer	2SC712D
Q207	Doubler	2SC710D
Q208	Doubler	2SC710D
Q209	Doubler	2SC710D
Q210	Pre-driver	2SC1303
Q211	AFP gate	CW01B
Q401	Driver	2SC731
Q402	Power amplifier	2SC1190
Q117	Tone burst generator	2SC712D
Q118	Tone burst generator	2SC712D
Q122	Tone burst trigger	SN7400N

Receiver

Q101	RF amplifier	3SK40
Q102	1st Mixer	2SC784R
Q103	1st IF amplifier	2SC784R
Q104	2nd Mixer	2SC712D
Q105	2nd IF amplifier	2SC712D
Q106	S-meter amplifier	2SC712D
Q107	Limiter amplifier	TA7061AP
Q108	1st Local oscillator	2SC712D
Q109	Buffer	2SC712D
Q110	2nd Local oscillator	2SC710D
Q111	AF amplifier	AN214
Q112	Noise amplifier	2SC712D
Q113	Noise rectifier	2SC712D
Q114	SQUELCH amplifier	2SC712D
Q115	SQUELCH amplifier	2SC712D
Q116	SQUELCH control	2SC712D
Q123	AF amplifier	2SC712D



BLOCK DIAGRAM

OPERATION

After all connections are made, rotate the SQUELCH knob fully counter-clockwise. Turn the VOLUME knob about one-half turn to apply power to the transceiver. If the transceiver is inoperative, check to determine if the pilot lamps which illuminate the meter and channel indicators are lighted. If not, recheck the power cord connections and fuse. Adjust the VOLUME control until the desired listening level is obtained. Select the desired channel by rotating the CHANNEL knob.

The SQUELCH control should be advanced slowly clockwise until background noise just disappears when a signal is not received. Excessive SQUELCH control insertion will mute the receiver even on strong signals.

To transmit, press the Push-To-Talk switch and speak into the microphone in a normal voice.

While the transceiver is in the transmit mode, a red lamp located above the channel selector will glow indicating RF output.

Release the Push-To-Talk switch to receive.

HI/LOW Switch

The FT-2FB is provided with a HIGH/LOW switch on the front panel to provide output power of either 10 watts or 1 watt. For short range communication, the low power position should be used for minimum current drain from the power source.

Meter Indicator

A meter is provided on the front panel to check the transceiver performance.

In the transmission mode, the meter indicates relative transmitter power output, and during operation in the receive mode, the meter indicates incoming signal strength. With a 100uV incoming signal, the meter will indicate 8 on the dial.

BURST Switch

BURST Switch is located on the rear of chassis. In the ON position, a tone signal of approximately 1800 Hz is transmitted for a very short time at the beginning of the transmission. With the switch in the OFF position, this signal is disabled.

Antenna

The FT-2FB is designed for use with a 50 ohm resonant antenna. The antenna is the most critical part of the transceiver installation. Communication range is dependent on how well the antenna system is installed and adjusted. A commercial 1/4 wave antenna is readily available from most local sources.

The length of coax cable between the transceiver and the antenna is not critical but the VSWR of the antenna (including cable) is important. If the VSWR is greater than 1.5 : 1.0, the antenna must be adjusted for a low VSWR to obtain maximum performance of the transceiver.

The output from the RF amplifier is then coupled to the first mixer Q102, 2SC784R.

The first mixer converts the RF signal into a 10.7 MHz intermediate frequency.

The output of the heterdyne oscillator Q108, 2SC-712D is amplified by the buffer stage Q109, 2SC-712D, and then coupled to a tripler D108, 1S1555 and multiplied. The frequency relationship is as follows :

$$\text{Xtal Frequency(MHz)} = \frac{\text{Signal Frequency -10.7}}{9}$$

The local oscillator injection signal is 10.7 MHz lower than the signal received.

The first IF (10.7 MHz) signal is fed to a first IF amplifier Q103, 2SC784R, through a crystal filter, and amplified and then applied to a second mixer Q104, 2SC712D.

The second heterodyne signal of 11.155 MHz is generated by Q110, 2SC712D, and then fed to the second mixer to produce the 455 kHz second IF signal.

The 455 kHz second IF signal is amplified by Q105, 2SC712D, through the ceramic-mechanical filter. This filter determines the bandwidth and selectivity of the receiver.

The signal is then applied to limiter amplifier Q107, TA7061AP integrated circuit. The limiter is designed so that input signal variations in amplitude produce no change in the amplitude of the output signal. The output from the limiter is applied to the discriminator where the FM signal is converted to the audio signal which is then fed to the audio amplifier Q111, AN212 integrated circuit. The amplifier delivers 2.5 watts maximum output to the speaker.

The receiver SQUELCH circuit consists of a noise amplifier, Q112, a rectifier, Q113, DC amplifiers Q114 and Q115, and a DC controller, Q116, 2SC-712D's. The noise produced at the output of the discriminator is amplified by Q112, and rectified DC voltage controls Q116 to conduct when noise is present. In the absence of a incoming RF carrier, this DC control cuts off the audio amplifier Q111, AN214 and thus speaker noise is eliminated. The SQUELCH threshold is adjusted by rotating the potentiometer on the front panel.

CRYSTAL CALCULATIONS

Transmit :

$$\text{Xtal Frequency(MHz)} = \frac{\text{Signal Frequency}}{8}\text{(MHz)}$$

Receive :

$$\text{Xtal Frequency} = \frac{\text{Signal Frequency -10.7}}{9}\text{(MHz)}$$

Accessory Socket Connection

Pin 1	Ground
Pin 2	NC
Pin 3	Discriminator output
Pin 4	Ground
Pin 5	Ground
Pin 6	DC +12V
Pin 7	DC +12V
Pin 8	DC +12V through power switch
Pin 9	PTT switch

For remote PTT operation, connect a switch between Pin 1 and Pin 9.

THEORY OF OPERATION

Transmitter

The transmitter is phase modulated and has crystal controlled 12 channels within the 144 - 148 MHz.

The audio signal from the microphone is coupled to the audio amplifier stages Q201 and Q202, 2SC-712D's. The audio output from Q202 is coupled to the IDC (instantaneous Deviation Control) circuit where both positive and negative peaks are clipped by diodes D201 and D202, 1S188's when they exceed a predetermined clipping level. The IDC control VR202 adjusts the audio level applied to the modulator and is used to set the maximum transmitter deviation to the predetermined value. The output from IDC circuit is amplified by an audio amplifier Q203, 2SC712D and fed to the last audio amplifier stage Q204, 2SC712D through the low pass filter which passes the audio less than 2500 Hz. The output from Q204 is applied to the phase modulator.

An oscillator stage Q205, 2SC712D oscillates at the fundamental crystal frequency which is multiplied 8 times in the following stages to produce the desired transmitting frequency. A variable trimmer capacitor is connected in series with the crystals to adjust the transmitting frequency precisely.

The oscillator output is coupled to the modulator circuit through the buffer stage Q206, 2SC712D.

The modulated output is then applied to the succeeding frequency multiplier stages to obtain the necessary frequency deviation at the transmitting frequency.

The frequency multipliers in the transmitter consist of three doublers Q207, Q208, and Q209, 2SC710D's.

Coils	Transistor	Frequency	Multiplication
L204, L205	Q207, 2SC710D	36 MHz	x 2
L206, L207	Q208, 2SC710D	72 MHz	x 2
L208, L209	Q209, 2SC710D	144 MHz	x 2

The RF signal is amplified by the buffer stage Q210, 2SC1303 and then coupled into class C amplifier stages which consist of driver Q401, 2SC731 and final amplifier Q402, 2SC1190. 10watts of RF power is delivered into a 50 ohm load through the pi-network passband filter.

AFP (Automatic Final Protection) circuit is provided to protect the final transistor against over load conditions, which may occur if the transmitter is keyed without an antenna or with a high VSWR antenna system. When the RF level at the collector of the final amplifier increase, diode D401, 1S188 detects this voltage and supplies a control voltage to the gate of Q211 (CW01B) which conducts. Thus the collector circuit of Q207, 2SC710D is grounded and RF energy is shunted to protect the following stages.

For low power operation, the power output is reduced to 1 watt by dropping the supply voltage to the final amplifier stages.

ATB (Automatic Tone Burst) circuit provides an audio tone burst of approximately 2800 Hz at the beginning of each transmission to activate the repeater.

A switch is provided on the rear panel to disable the tone burst signal, if desired.

Receiver

The receiver is a double conversion super heterodyne which is designed for reception of FM signals on any of 12 fixed crystal controlled channels within the range of the 144 - 148 MHz band.

The signal received at the antenna is coupled to the RF amplifier Q101, 3SK40 through T-R change over relay. Q101 is a MOS FET transistor which provides high rejection to cross modulation and intermodulation effects caused by strong input signals.

Adjust L208 and L209 for maximum RF output at desired frequency. Adjust TC213, TC406, TC401, TC403 and TC404 for maximum output at the desired frequency.

A frequency counter should be used to determine the transmitting frequency. If a counter is not available adjust the trimmer capacitor connected in series with the transmitting crystal for the best audio quality on another receiver operating at the frequency.

Adjust L214 and VR203 for the above.

AUTOMATIC FINAL PROTECTION CIRCUIT ADJUSTMENTS

Connect the VTVM between the gate of Q211 and ground.
Adjust VR3 for minimum VTVM reading.

Disconnect the antenna and adjust VR204 until the power output meter indicates Zero reading.

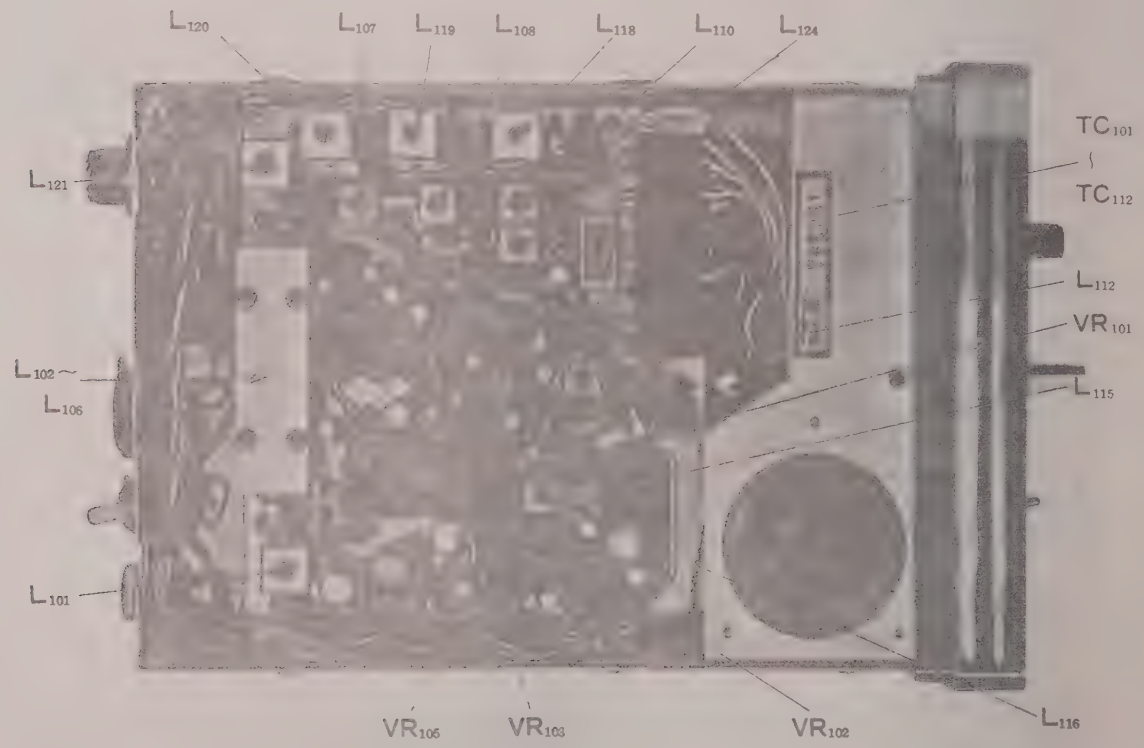
RECEIVER ALIGNMENT

Connect VTVM RF probe to TP102 and peak L118 and L119 for maximum VTVM reading. Set the signal generator to the receiver frequency and connect to the antenna terminal.

Adjust L101 through L108, L110 and L112 for maximum reading on the S-meter.

Connect the VTVM to Pin 3 on the accessory socket and ground.
Detune L116 by rotating the tuning core fully clockwise, and adjust L115 for maximum VTVM reading. Then adjust L116 for zero VTVM reading.

This completes the transceiver alignment.



BOTTOM VIEW

The FT-2FB transceiver has been aligned and calibrated at the facfory with proper test instruments, and should not require realignment. Service or replacement of major components may necessitate subsequent realignment. Do not attempt alignment unless the operation of the transceiver is fully understood.

Test Equipment Required

A signal generator, vacuum tube volt meter, and a RF wattmeter.

Voltage and Resistance Measurements

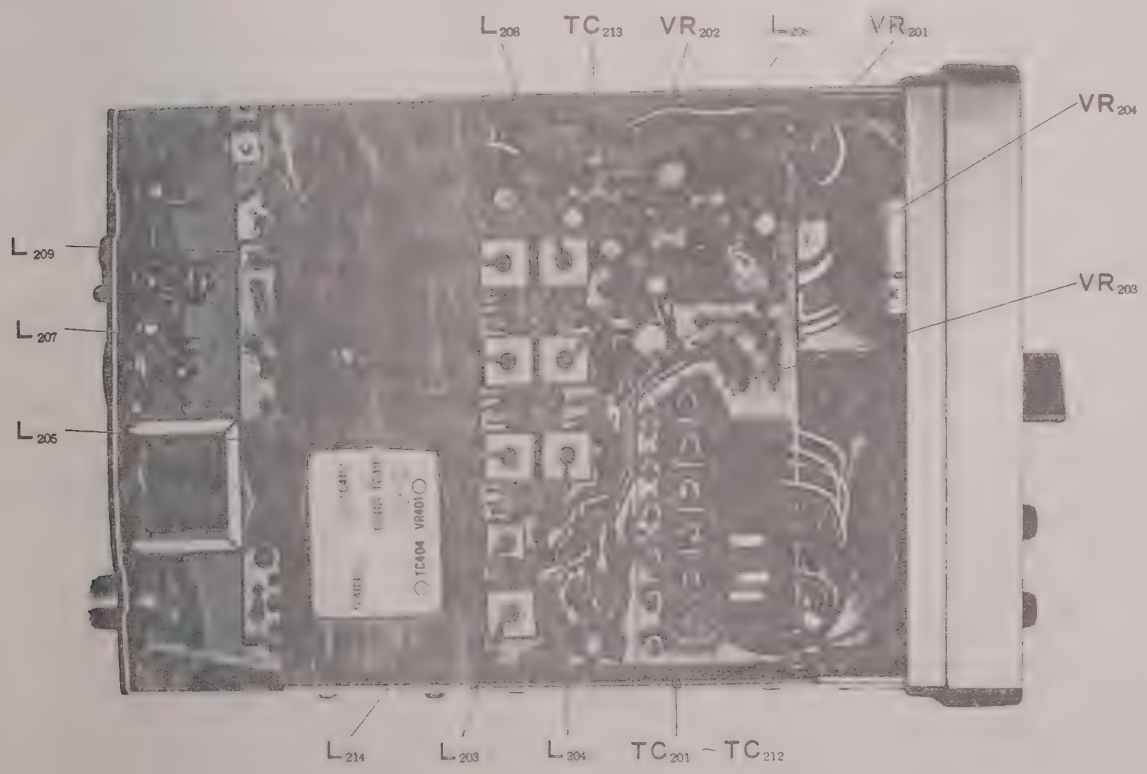
Charts are provided listing voltage and resistance values from transistor pins to ground. Measurements are to be made with a VTVM.

TRANSMITTER ALIGNMENT

Test points are provided in the chart below to facilitate alignment. Extreme care is required to avoid tuning of coils to the improper harmonic. When adjusting coils always tune to the peak that provides maximum output at the desired transmitting frequency.

TP201	TP202	TP203
1.3V DC	0.7V DC	1.2V DC

Connect the RF wattmeter to the antenna terminal. Connect VTVM between TP201 and ground and tune L203 for maximum reading. Connect VTVM to TP202 and adjust L204 and L205 for maximum. L206 and L207 for TP203.



TOP VIEW

VOLTAGE CHART

No.	Emitter or Source	Base or Gate	Collector or Drain	No.	Emitter	Base	Collector
Q101	0.52	(1) 0 (2) 3.5	8.5	Q123	1.98	1.30	4.95
Q102	0.16	0.76	8.5	Q			
Q103	0.31	0.89	8.4	Q201	0.17	0.73	5.1
Q104	0.83	1.45	7.2	Q202	2.45	3.10	3.1
Q105	0.93	1.58	6.5	Q203	3.75	4.35	8.4
Q106	0.01	0.46	8.7	Q204	0.31	0.93	8.7
Q108	1.54	5.4	6.3	Q205	4.75	4.70	3.45
Q109	0.75	1.35	8.0	Q206	1.35	0.88	9.2
Q110	0.55	0.99	5.2	Q207	1.16	1.42	9.8
Q112	1.30	1.92	8.7	Q208	0.86	−0.73	9.2
Q113	3.60	3.10	8.7	Q209	1.34	−1.30	12.4
Q114	0.09	0.75	0.15	Q210	0	−0.12	12.2
Q115	0.09	0.07	5.5	Q401	0	0	12.9
Q116	0	0.66	0.01	Q402	0	−0.05	12.5
Q117	1.98	1.30	4.95	No.	Cathode	Gate	Anode
Q118	1.98	1.15	5.1	Q211	0	0.34	9.9

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Q107	1.9	1.9	6.0	0	6.6	1.9	1.9							
Q111	6.3	0	7.6	11.5	6.2	0	5.7	13.0	13.5					

* Voltage values are in volts DC, and measured by VTVM.
* Both VOL and SQUELCH controls fully counter clockwise.

RESISTANCE CHART

No.	Emitter or Source	Base or Gate	Collector or Drain	No.	Emitter	Base	Collector
Q101	200	(1) 100K (2) 13.5K	280	Q123	540	27K	2.4K
Q102	940	3K	460	Q			
Q103	710	3K	680	Q201	650	23K	13K
Q104	730	3.9K	1.35	Q202	1K	13K	1.7K
Q105	220	4.5K	800	Q203	700	12.5K	190
Q106	1K	13K	350	Q204	150	220	780
Q108	150	3.9K	570	Q205	1.5K	15K	90
Q109	320	3.8K	580	Q206	330	4K	90
Q110	460	2.9K	1.5K	Q207	100	4K	250
Q112	480	5.3K	350	Q208	56	1.4K	260
Q113	4K	51K	3.2K	Q209	56	1.4K	70
Q114	21	84K	1.8K	Q210	0	100	70
Q115	21	55K	1.8K	Q401	0	0.7	70
Q116	0	58K	2.3K	Q402	0	0.7	70
Q117	540	27K	2.4K	No.	Cathode	Gate	Anode
Q118	540	27K	2.4K	Q211	0	1.7K	260

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Q107	1.4K	1.2K	1.2K	0	0.8K	1.4K	1.4K							
Q111	1.2K	0	1.2K	2.4K	1.2K	0	1.8K	45K	0.05K					

* Values are in ohms, and measured by VTVM.
* Both VOL and SQUELCH controls fully counter clockwise.

117, 136, 142, 152, 158	¼W	4.7KΩ	±10%
160, 164, 168, 188, 197,			
223, 230			
121	¼W	5.6KΩ	±10%
218	¼W	6.8KΩ	±10%
126, 132, 146, 154, 157,	¼W	10 KΩ	±10%
159, 161, 169, 172, 173,			
192			
179, 208, 209	¼W	15 KΩ	±10%
102, 116, 122, 135,	¼W	22 KΩ	±10%
143, 148, 163, 165, 180,			
181, 190, 204, 210, 211,			
220, 229, 403, 404			
110, 125, 212, 221	¼W	27 KΩ	±10%
103, 107, 134, 202, 224	¼W	33 KΩ	±10%
114, 115, 130, 131, 167	¼W	47 KΩ	±10%
182			
101	¼W	100 KΩ	±10%
153	¼W	220 KΩ	±10%
CARBON COMPOSITION			
219	½W	47 Ω	±10%
195	½W	680 Ω	±10%
196	1 W	39 Ω	±10%
WIRE-WOUND			
405	10W	18 Ω	±10%

VR-VARIABLE RESISTOR		
1	EVHBOKK15A14	10KΩA
2	EVHBOAK15B24	20KΩB
201	EVLSOA00B52	500 ΩB
105	EVLSOA00B13	1KΩB
202	EVLSOA00B53	5KΩB
102, 103, 203, 204	EVLSOA00B14	10KΩB
101	EVLSOA00B54	50KΩB
401	SR19R001	47KΩB

L-INDUCTOR		
1	AF CHOKE 2.4mH	2.5A
101	ANT. TRANS.	
102	R. F. RESONATOR-A	
103～105	R. F. RESONATOR-B	
106	R. F. RESONATOR-C	
107, 108 110, 124	10.7MHz IFT	
110, 116, 112	455KHz IFT	
115	455KHz IFT	
118	LOCAL OSCILLATOR	
119	L. O. BUFFER	
120	L. O. MULTIPLIER-A	
121	L. O. MULTIPLIER-B	
203	MODULATOR	
204	MULTIPLIER-A	36MHz
205	MULTIPLIER-B	36MHz
206	MULTIPLIER-A	72MHz
207	MULTIPLIER-B	72MHz
208	MULTIPLIER-A	144MHz
209	MULTIPLIER-B	144MHz
213,403,407,408,409	TUNING COIL	144MHz
214	MODULATOR	
109	R. F. CHOKE COIL-A	
402, 404, 406	R. F. CHOKE COIL-B	
212	R. F. CHOKE COIL-C	
117, 210, 401, 405	10μH	
202, 211	250μH	
113	510μH	
112, 114, 122, 123	2mH	
201	68mH	

F-FILTER		
101	CRYSTAL FMT-30	
102	CERAMIC CFM-455B	

J-RECEPTACLE & SOCKET		
1	ACCESSORY	S-B7706
2	POWER	FM-142
3	MICROPHONE	FM-144
4	ANTENNA	JSO-239
5	EXT. SPEAKER	P-2240

S-SWITCH	
1	SRE-E22CF-30AE
2, 4	MST-206N

SP-SPEAKER	
1	BELCOM B-22

M-METER	
1	MK-23

PL-INDICATOR LAMP	
1～3	14V40mA

PB-PRINTED CIRCUIT BOARD	
PB-1133(A～Z)	TMTR. DRIVER
PB-1143(A～Z)	TMTR. BOOSTER
PB-1146(A～Z)	RECEIVER

XS-CRYSTAL SOCKET	
101, 201	S-20 12P

X-CRYSTAL	
101～112	RCVR. L. O. CRYSTAL
113	HC-18/U 11.155MHz
201～212	TMTR. OSC. CRYSTAL

RL-RELAY	
401	MT-2 12V 25mA

Q-IC, FET, SCR & TRANSISTOR

TRANSISTOR		
110, 207～209	2SC710D	
103～106, 108, 109, 112～118, 122, 201～206	2SC712D	
401	2SC731	
102	2SC784R	
402	2SC1190	
210	2SC1303	
FIELD EFFECT TR.		
101	3SK39Q	
INTEGRATED CIRCUIT		
111	AN212	
107	HA1111	
121	SN7400N	
S. C. R.		
211	CW01B	

D-DIODE

101～103, 105, 106, 109, 112, 201, 202, 401, 402	GERMANIUM 1S188FM1		
SILICON			
108	1S1555		
1	DS130ND		
104	V06B		
ZENER			
113	AW0109	9V	1W
110, 203	WZ090	9V	500mW
111	1S330	5V	250mW
VARACTOR			
204	MX1		

C-CAPACITOR

DIPPED MICA			
153, 241, 410, 412	50WV	1PF	±0.5PF
108, 157, 234	50WV	2PF	±0.5PF
101, 228, 246, 416	50WV	5PF	±0.5PF
6, 152	50WV	8PF	±0.5PF
151, 240	50WV	10PF	±1PF
148, 242, 406, 408	50WV	15PF	±10%
140, 244, 247～258	50WV	20PF	±10%
102, 115, 155, 233, 407	50WV	30PF	±10%
109, 194～200, 1101～1105, 245	50WV	40PF	±10%
107, 203, 227	50WV	50PF	±10%
139, 154	50WV	60PF	±10%
236, 237	50WV	70PF	±10%
138, 403	50WV	80PF	±10%
112, 217, 225, 230, 231	50WV	100PF	±10%
132	50WV	120PF	±10%
215	50WV	180PF	±10%
133, 134	50WV	300PF	±10%
124, 125	50WV	400PF	±10%
170	50WV	470PF	±10%

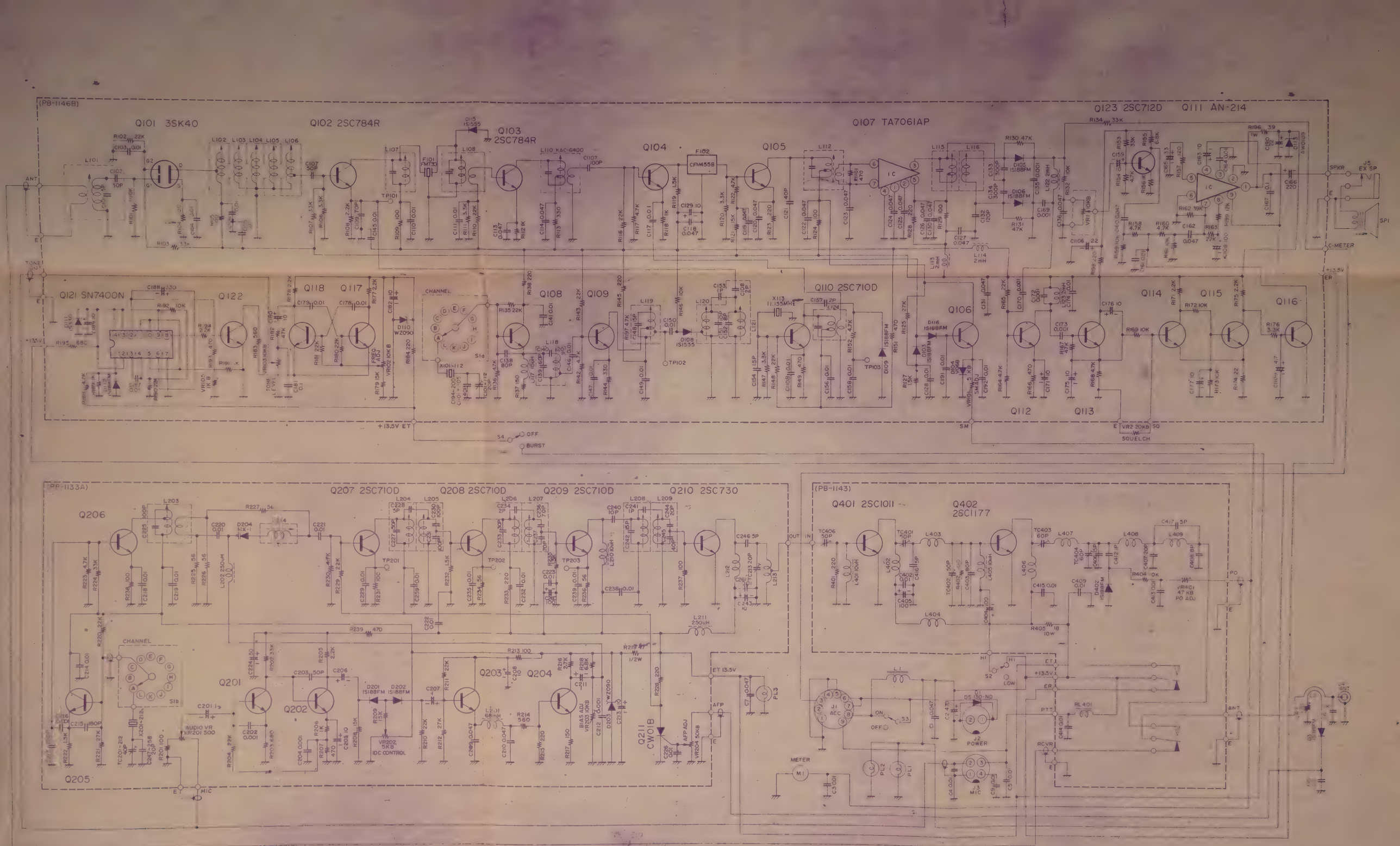
CERAMIC DISC			
135, 169, 172, 173, 202, 204, 212, 216	50WV	0.001μF	$^{+80}_{0}$%
3～5, 9, 103～106, 110, 111, 119, 121, 122, 141, 145, 146, 149, 150, 156, 158, 174, 187, 191, 192, 214, 218～223, 226, 229, 232, 235, 238, 239, 259, 261, 402, 409, 411, 413～415	50WV	0.01μF	$^{+80}_{0}$%
1, 7, 113, 114, 116～118, 120, 123, 126～128, 130, 131, 136	50WV	0.047μF	$^{+80}_{0}$%
ELECTROLYTIC			
188	6.3WV	330μF	
201, 206, 207, 211	16WV	1μF	
129, 159, 160, 162, 163, 168, 171, 175～177, 180, 182, 189, 205, 208 213, 243	16WV	10μF	
165	16WV	33μF	
224	16WV	47μF	
190, 260, 404, 405	16WV	100μF	
166, 193	16WV	220μF	
2	16WV	470μF	
PLASTIC FILM			
164, 178, 179	50WV	0.01μF	±20%
161, 209, 210	50WV	0.047μF	±20%
167, 181	50WV	0.1μF	±20%

TC-TRIMMER CAPACITOR

CERAMIC	
213	ECV1ZW20P32
101～112	ECV1ZW20P50
201～212	ECV1ZW40P32
401, 402, 406	ECV1ZW50P32
403, 404	CV08S600

R-RESISTOR

CARBON FILM				
174	¼W	22	Ω	±10%
225～227, 234, 236	¼W	56	Ω	±10
105, 109, 170, 201, 213, 231, 237, 238, 402	¼W	100	Ω	±10%
129, 137, 217	¼W	150	Ω	±10%
104, 123, 138, 145, 184, 215, 228, 233, 401	¼W	220	Ω	±10
113, 144,	¼W	330	Ω	±10%
124, 149, 151, 162, 166, 193, 207, 239	¼W	470	Ω	±10%
183, 214	¼W	560	Ω	±10%
203	¼W	680	Ω	±10%
112, 118, 156, 189, 191, 206	¼W	1	KΩ	±10%
119, 120, 127, 155, 222, 232, 235	¼W	1.5	KΩ	±10%
108, 150, 171, 175, 177, 178, 194, 205	¼W	2.2	KΩ	±10%
216	¼W	2.7	KΩ	±10
106, 111, 128, 147, 176	¼W	3.3	KΩ	±10

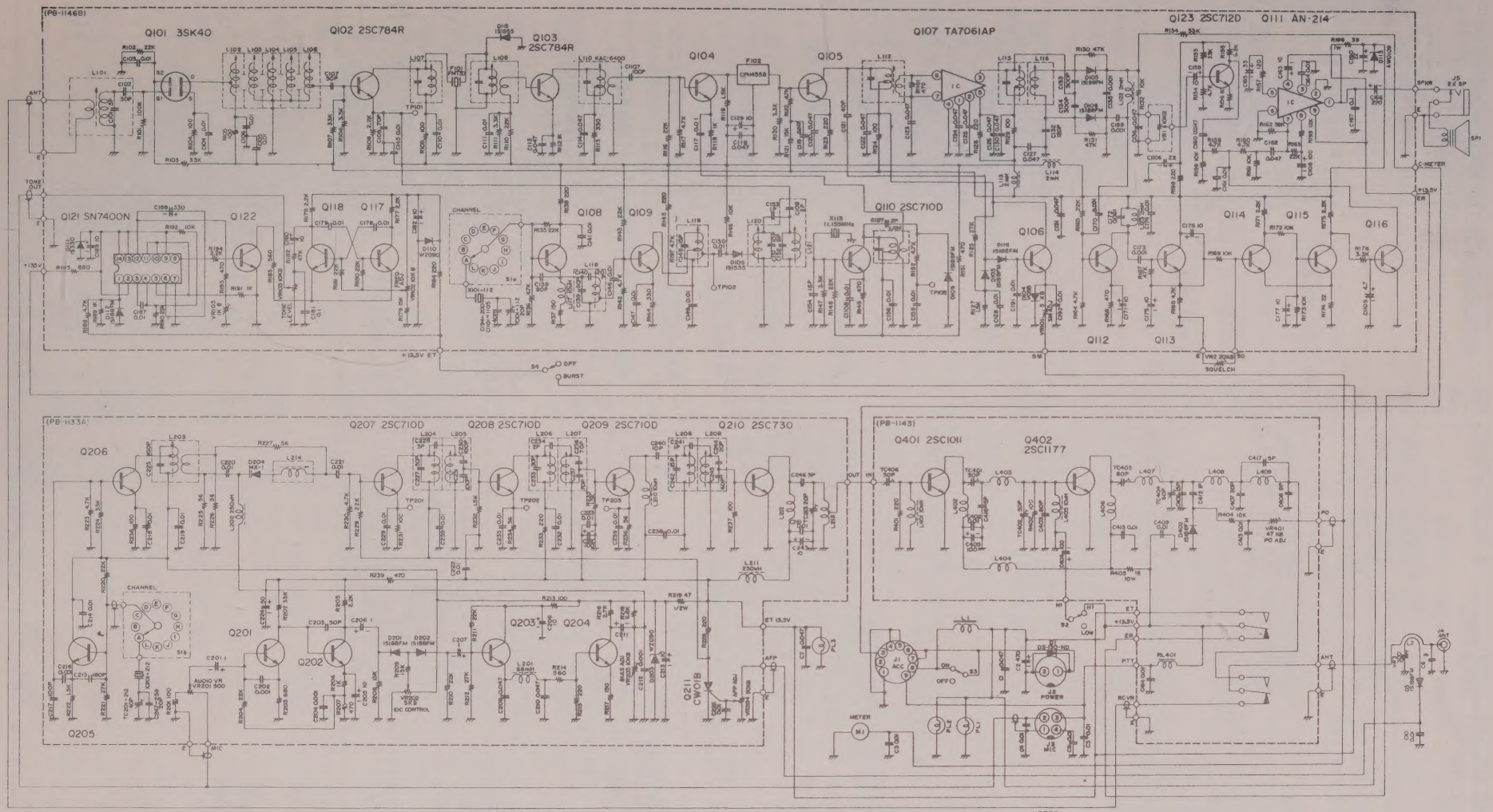


NOTES:

1. ALL TRANSISTORS ARE 2SC712D UNLESS OTHERWISE NOTED.
2. ALL RESISTORS IN Ω 1/4W 10% UNLESS OTHERWISE NOTED.
3. ALL CAPACITORS IN uF UNLESS OTHERWISE NOTED.
4. * VALUE IS NOMINAL.

+ — 16WV

FT-2F B
CIRCUIT DIAGRAM



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+ 16WV

FT-2F B
CIRCUIT DIAGRAM

YAESU

94085